

File No.: 34300

24 June 2021

Sovereign Palms Limited
PO Box 13 349
CHRISTCHURCH 8141

Dear Chris,

**GEOTECHNICAL INVESTIGATION AND FOUNDATION RECOMMENDATIONS:
, STAGE 1, OAKBRIDGE SUBDIVISION.**

1.0 INTRODUCTION

Davis Ogilvie & Partners Ltd. (Davis Ogilvie) has been commissioned by Sovereign Palms Ltd to determine the ground bearing capacity and provide foundation recommendations for Stage 1 of the Oakbridge Subdivision in Marshlands, Christchurch.

The published geology of the site has been identified as “*Dominantly alluvial sand and silt overbank deposits*” (Yaldhurst Member) of the Springston Formation¹.

The underlying geotechnical report written by Davis Ogilvie² in August 2017 recommended a Ministry of Business, Innovation & Employment (MBIE) Residential Technical Category of TC1³ be assigned to XXXX. The future expected performance for a TC1 site, in accordance with MBIE, is that “*Future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances*”.

Davis Ogilvie has undertaken engineering design and supervision throughout Stage 1 subdivision construction. Based on construction observation records, is underlain by up to 0.88 m of engineered fill⁴ consisting of site sourced sand/silt. The fill was placed in accordance with NZS 4431:1989 (Code of practice for earth fill for residential development).

¹ Brown, L.J.;Weeber, J.H., (1992) “Geology of the Christchurch Urban Area” Institute of Geological and Nuclear Sciences.

² Davis Ogilvie (August 2017) Geotechnical Report for Subdivision, 203 Prestons Road, Redwood, Christchurch.

³ Ministry of Business, Innovation & Employment (MBIE): Guidance for Repairing and Rebuilding Houses Affected by the Canterbury Earthquakes (December 2012), Reference Material.

⁴ Davis Ogilvie (June 2021) Engineering Design, Fill plan Stage 1. Ref 34300 FP01

2.0 SUBSOIL TESTING AND RESULTS

Prior to any filling, site inspections of the natural ground conditions were undertaken by Davis Ogilvie to confirm the presence of suitable subgrade soils. Any areas of unsuitable or soft soils were over excavated and backfilled with engineered fill as per NZS 4431:1989. During the inspection, Dynamic Cone Penetrometer (DCP) testing was undertaken on the subgrade to at least 1.0 m below the original ground level. The subgrade tests confirmed suitable material in the shallow underlying soils.

Following fill placement, two DCPs were undertaken on the lot to a maximum depth of 2.5 m below the Final Ground Level (FGL), and one Hand Auger (HA) to 0.6 m below FGL where refusal on gravel inclusions in the engineered fill prevented further advancement. These test locations are presented in the attached Geotechnical Site Plan G22A, and DCP and HA logs are enclosed.

Based on the shallow testing undertaken on the site and construction observations, the general subsurface profile consists of up to 0.40 m of topsoil underlain by engineered fill followed by inferred natural interbedded deposits of silt and sand. The indicative soil profile across the site is presented in Table 1.

Table 1: Summarised Soil Profile from Shallow Investigation				
Summary of Soil Type	DCP (blows / 100 mm)	Relative Density / Consistency	Depth Below EGL (m)	
			DCP 1 *	DCP 2 + HA
TOPSOIL	1 – 5	**	0.0 – 0.4	0.0 – 0.4
SILT (Engineered Fill)	11 – 22	Very Stiff to Hard	0.4 – 0.9	0.4 – 1.1
SILT / SAND (Inferred)	6 – 9	Stiff to Very Stiff / Medium Dense to Dense	0.9 – 1.8	1.1 – 1.8
	10 – 23	Very Stiff to Hard / Dense to Very Dense	1.8 – 2.5	1.8 – 2.5
* Soil profile inferred from nearby testing logs. ** Relative density not assigned to topsoil due to the propensity for settlement.				

Groundwater was not encountered during the Davis Ogilvie May 2021 shallow investigation however may be deeper than the investigated depth.

3.0 FOUNDATION RECOMMENDATIONS

'Good Ground' (as defined by NZS 3604:2011) has generally been achieved in the near surface soils of the lot. Based on in-situ soil testing, an ultimate bearing capacity of 300 kPa⁵ was typically encountered from 0.40 m below FGL below the organic topsoil.

⁵ Below organic topsoil. Defined by NZS 3604:2011

The bearing capacities presented in this report are static geotechnical ultimate bearing capacities. In accordance with MBIE guidance the "structural" Ultimate Limit State (ULS) bearing capacity, to be used in conjunction with fully factored loads as per AS/NZS 1170, should be derived using a strength reduction factor in the vicinity of 0.5. The allowable bearing capacity to be used in conjunction with Serviceability Limit State (SLS) loads should be derived using a strength reduction factor of 0.33.

Tied NZS 3604 slabs are considered an appropriate founding solution for this TC1 classified lot. All organic topsoil or any other unsuitable material should be stripped from beneath the entire building footprint prior to any foundation construction onsite.

All excavations on site should be examined by a suitably qualified and experienced Engineer or Engineering Geologist prior to any fill placement and foundation construction. The Engineer must be competent to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. Should soft, suspect, or unsuitable conditions differing to those outlined in this report be encountered, the builder should contact Davis Ogilvie or a suitably qualified and experienced Engineer to confirm foundation requirements.

4.0 CLOSURE

Should you have any queries regarding this report or wish to arrange a subgrade inspection at the time of construction, please contact the undersigned.

Yours faithfully

DAVIS OGILVIE & PARTNERS LTD.



Prepared By:

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Reviewed By:

BJORN RAASCH

Senior Engineering Geologist

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Enclosed:

1 x Geotechnical Site Plan (DWG G22A)

2 x Dynamic Cone Penetrometers and 1 x Hand Auger Log

Limitations

Davis Ogilvie did not complete an assessment of all possible conditions or circumstances that may exist at the site. The report and findings are based on the information provided. Conditions may exist which were undetectable given the limited investigation of the site. Variations in conditions may occur, and there may be conditions onsite which have not been revealed by the investigation, which have not been taken into account in the report. No warranty is included—either expressed or implied—that the actual conditions will conform to the assessments contained in this report. If any unexpected suspect soils are encountered during earthworks onsite, Davis Ogilvie should be notified to confirm or reassess the foundation recommendations.

This report has been prepared solely for the purposes of Sovereign Palms Limited. The information contained herein is confidential, and shall not be passed on to any third party without prior written permission of Davis Ogilvie & Partners Ltd. No responsibility is accepted for any use outside the scope of this report. This report does not cover suitability of the site (e.g., flooding), or potential future liquefaction.

Important Notice:

Information included in this report was obtained/created from maps and/or data extracted from the New Zealand Geotechnical Database (<https://www.nzgd.org.nz>), which were prepared and/or compiled for the Earthquake Commission (EQC) to assist in assessing insurance claims made under the Earthquake Commission Act 1993. The source maps and data were not intended for any other purpose. EQC and its engineers, Tonkin & Taylor, have no liability for any use of the maps and data or for the consequences of any person relying on them in any way.

Project: , Stage 1, Oakbridge Subdivision, Christchurch

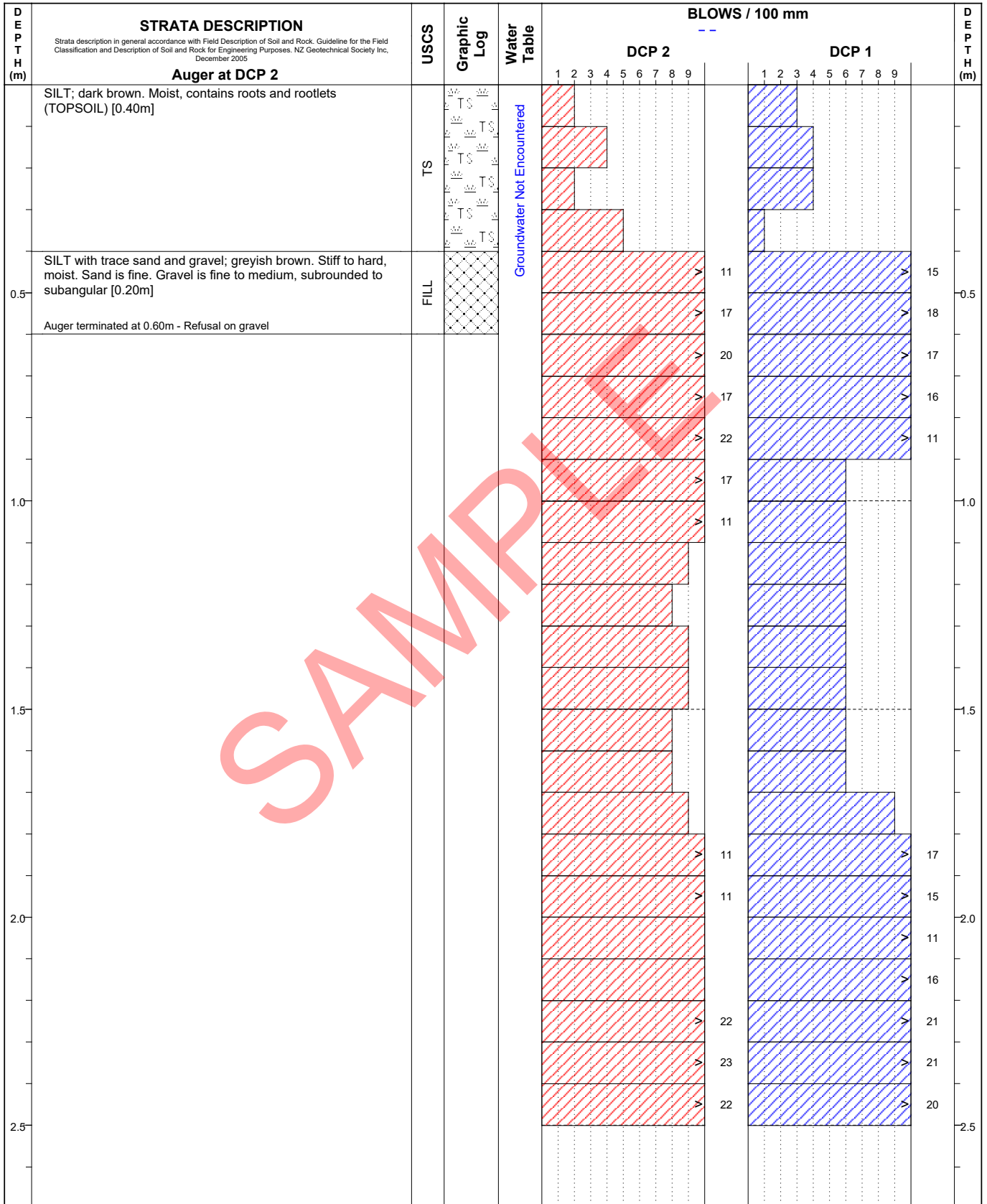
Client: Sovereign Palms Ltd

Test Location: Refer to attached Geotechnical Site Plan (G22A)

Date: 21/05/21

Time: 3:00 p.m.

Excavation Method: HA + DCP



Logged By: IZ

Plotted By: IZ

Checked By: KL

Notes:

Dynamic Penetrometer Test and logs give an indication of the ground condition at the location of the tests only. While they are representative of typical conditions across the site, they do not identify variations in the ground away from the test locations. This log does not cover slope stability or suitability of the site for building.

Dynamic Cone Penetrometer Test performed in accordance with NZS 4402 Test 6.5.2 (Procedure 1 and 2)